Institute of Digital Healthcare

Collaborative Models for Healthcare Innovation

Professor David Mullins

Director External & International Relations, WMG, University of Warwick

WMG
THE UNIVERSITY OF WARWICK

Innovation within Healthcare System

Institute of Digital Healthcare

- NHS National Institute for Healthcare Research
  - Biomedical Research Centres , Translational Research Partnerships
  - Clinical Research Facilities, Clinical Research Networks etc.
- Charities – BHF, Cancer Research UK, Wellcome Trust etc.
- Research Councils – MRC and BBSRC
- Companies - Pharmaceutical etc.

WMG
THE UNIVERSITY OF WARWICK

Innovation **into** Healthcare System

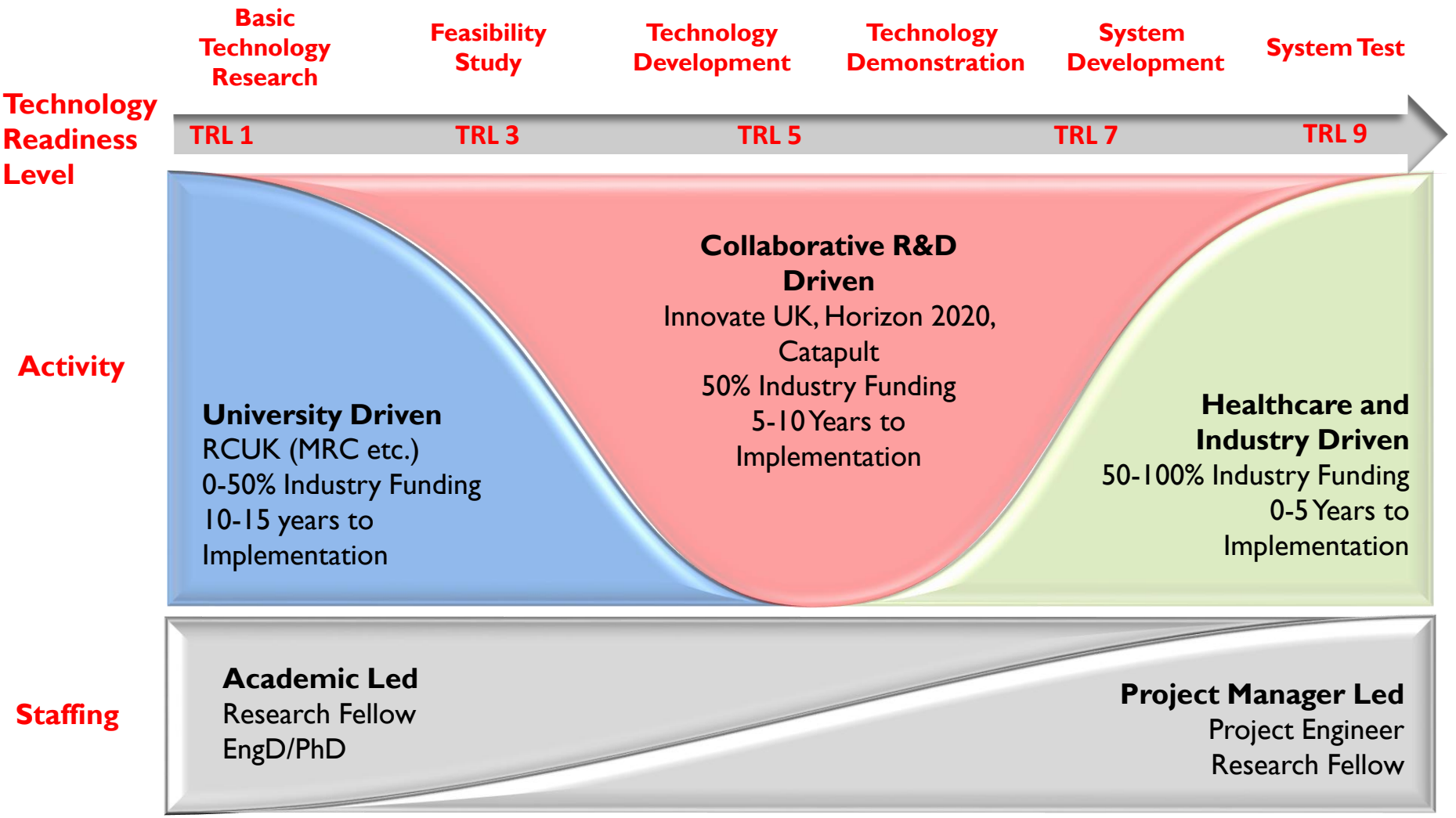
Institute of Digital Healthcare

- With Universities
- With multiple organisations
- To access ‘big facilities’
- Innovations from external disciplines - IDH
- Innovations from SMEs
- To exploit new areas of opportunity
- Education and training
- The role of impact

WMG
THE UNIVERSITY OF WARWICK

Research Landscape

Institute of Digital Healthcare



WMG
THE UNIVERSITY OF WARWICK

Academic Health Science Networks

Institute of Digital Healthcare

west midlands ACADEMIC HEALTH SCIENCE NETWORK

IDH hosts the Digital Innovation Service for the WM AHSN
And runs the West Midlands Health Informatics Network (WIN)

WMG THE UNIVERSITY OF WARWICK

With Universities

- **UK Research Partnership Investment Fund**

- RM 218M - GSK Carbon Neutral Lab for Sustainable Chemistry (GSK and Nottingham)
- RM 308M - Institute of Cancer Research (Manchester, Christie Hospital and Cancer Research UK)
- RM 545M - Centre for Children's Rare Disease Research (UCL, Great Ormond Street Hospital)
- RM 205M - Institute of Health Sciences (QU Belfast, Altalia Philanthropies and Wellcome/Wolfson)

With Multiple Organisations

Institute of Digital Healthcare

- **The Francis Crick Institute**
- RM 4.1bn. - opens 2016, 1250 co-located scientists

http://crick.ac.uk

WMG
THE UNIVERSITY OF WARWICK

The Francis Crick Institute

Institute of Digital Healthcare

- Biomedical Discovery Institute
  - MRC, Cancer Research UK, Wellcome Trust, UCL, Imperial College, Kings College London
- Why disease develops? – treat, diagnose, prevent major diseases
- Researchers, disciplines, academic institutions, healthcare organisations and business e.g.
  - Open Science Collaboration with GSK
- Highest quality science, young and emerging talent

WMG
THE UNIVERSITY OF WARWICK

To Access ‘Big Facilities’

- **Research Complex @ Harwell**

- RM 170 M Labs and Shared Facilities for Structure of Matter

- Adjacent to DIAMOND, ISIS and CLF

- Imaging (live biological cells), Structural Molecular Biology (proteins), Dynamic Processes (DNA molecules)

- Long term residencies

From external disciplines

- **Institute of Digital Healthcare**
- To improve people's health and wellbeing through the use of innovative digital technologies
- To deliver excellent research, training and implementation
- To achieve translational impact in society

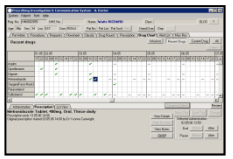
- 45 members - Interdisciplinary profile

Patient & population data: Deriving new knowledge & measure performance

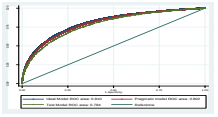
Institute of Digital Healthcare

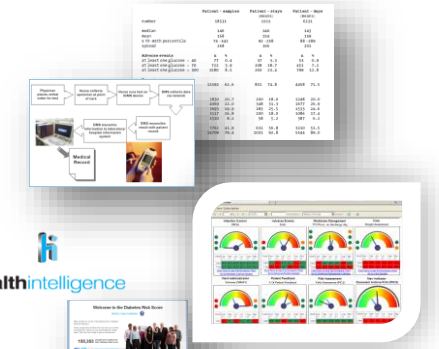
- Big Data analysis
  - Primary care data, e.g. Electronic Healthcare Records, THIN
  - Hospital data, e.g. PICS
  - Collaboration with the University Hospital Birmingham NHS Trust
- Clinical Research Informatics
  - Clinical Trial Management Systems
  - EU TRANSFoRm FP7 Programme
  - WM AHSN

cegedim



Birmingham Systems PICS





emis

healthintelligence

emis

emis

emis

tpp

MSD Informatics

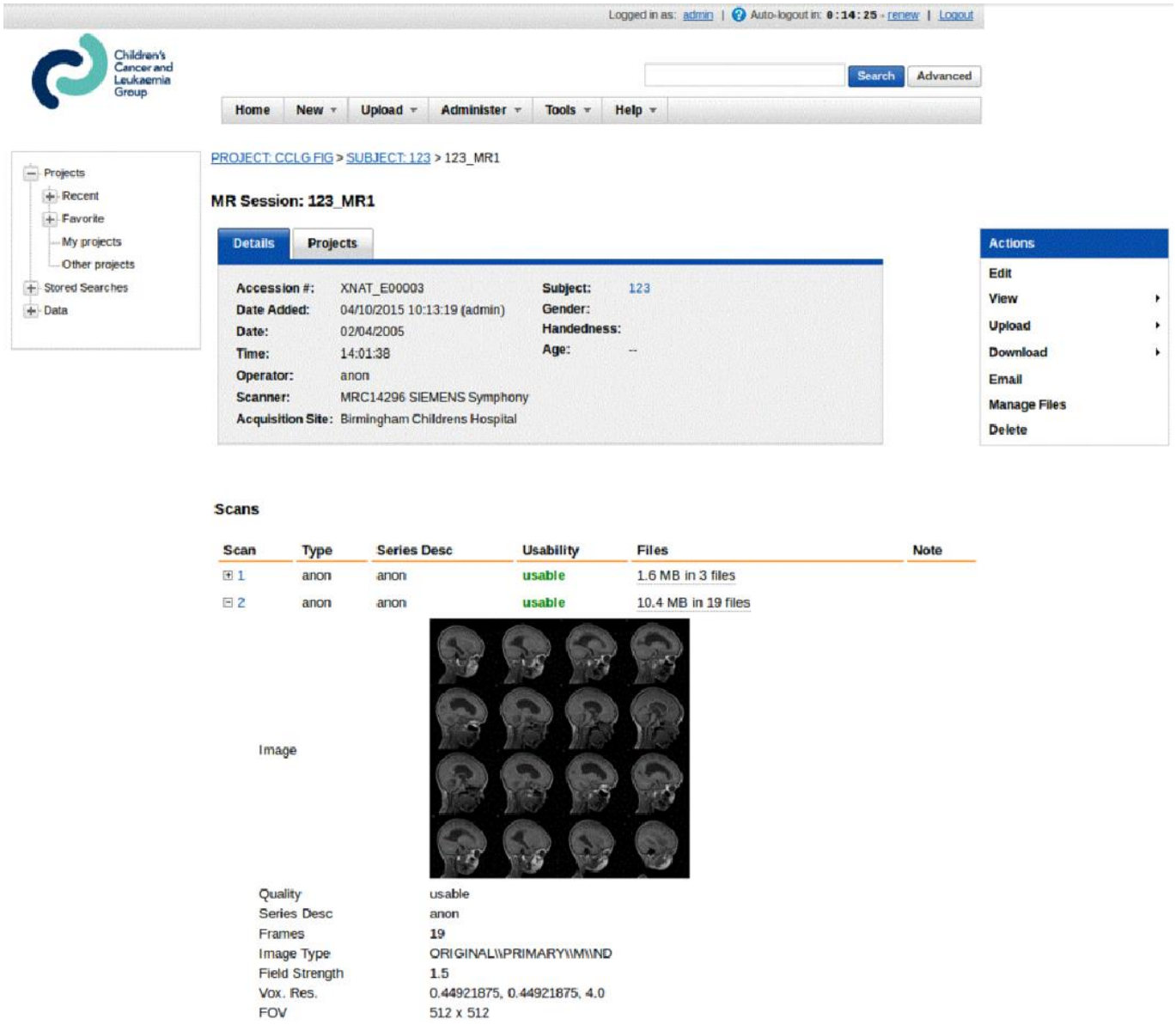
European Commission

west midlands ACADEMIC HEALTH SCIENCE NETWORK

WMG THE UNIVERSITY OF WARWICK

Brain Cancer Database for Children

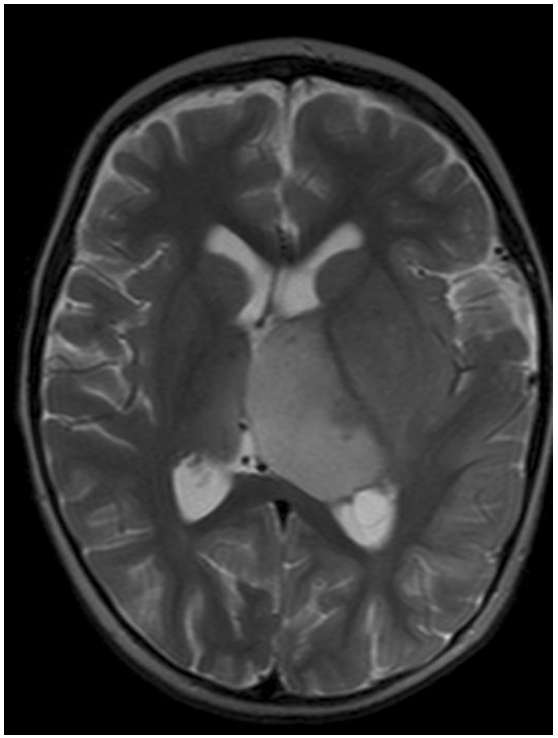
Institute of Digital Healthcare



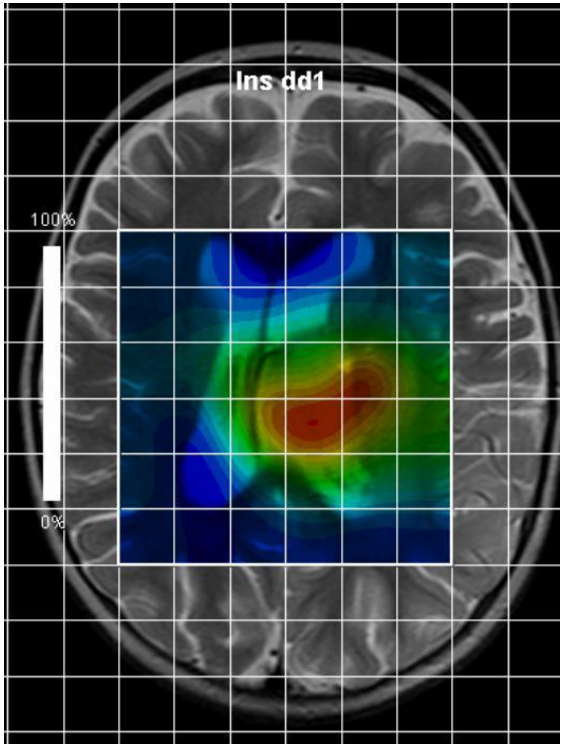
WMG
THE UNIVERSITY OF WARWICK

Spectroscopic imaging in clinical decisions

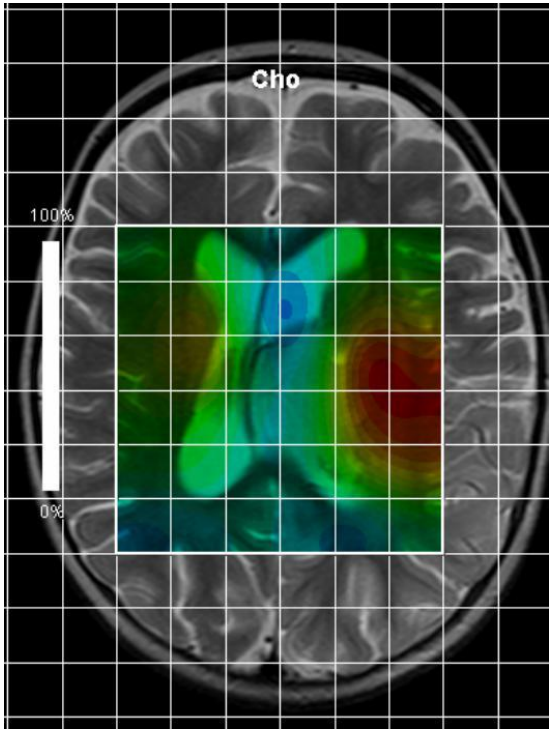
Thalamic diffuse astrocytoma



mIns – low grade



Cho – high grade



A.C.Peet, T.N.Arvanitis, M.O.Leach, A.. D Waldman, *Nat. Rev. Clin. Oncol. 2012;(9):700-711*

Cybersecurity of Medical Devices

Institute of Digital Healthcare

- In 2012, Jay Radcliffe, an Idaho-based hacker and Type 1 diabetic, demonstrated that hackers could manipulate his insulin pump. A lethal dose of 45 days insulin could be administered in a single bolus to the patient resulting in hypoglycemia.

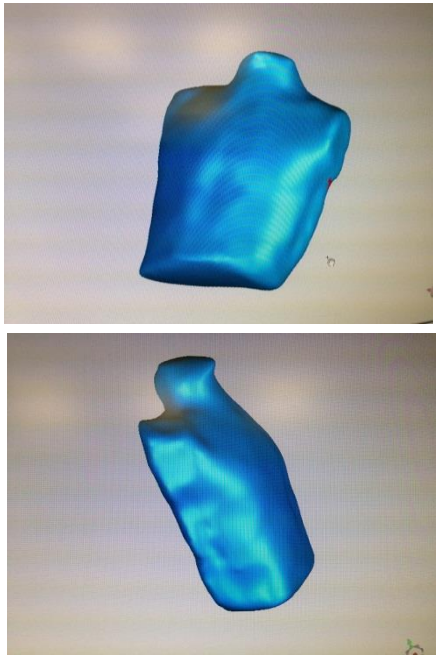
- Kevin Fu and James Blum reported Conficker malware on 104 devices at the James A. Haley Veterans' Hospital in Tampa. Affected devices included X-ray machine and mammography.

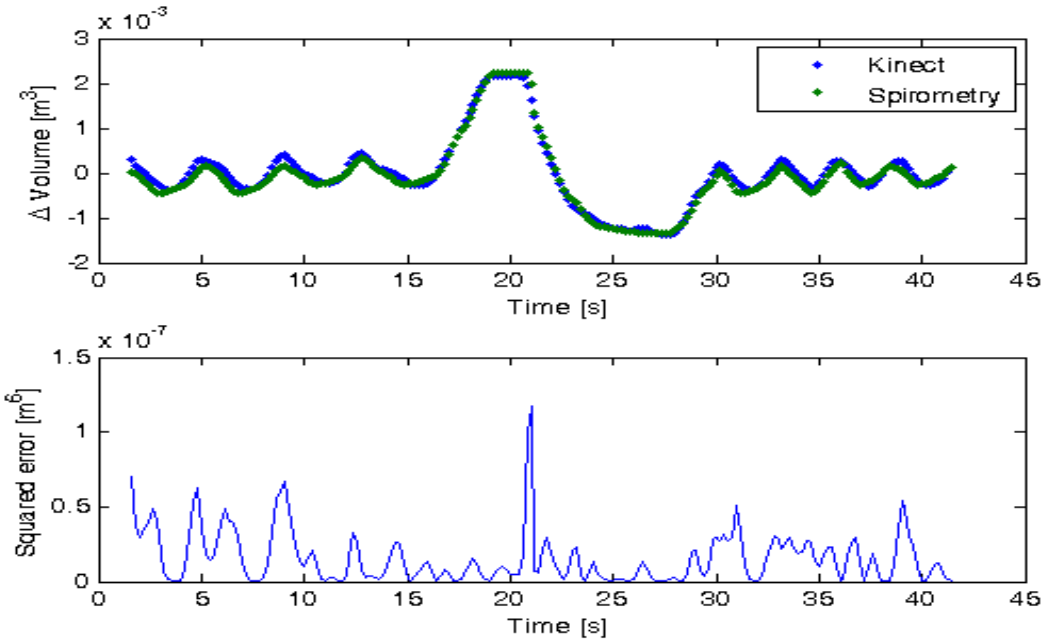
Clinical Evaluation

Institute of Digital Healthcare

- Evaluation in the Clinical Setting / Involvement of Clinical Staff in the Technology Design Process

CASE STUDY:
A Chest Wall Motion Assessment System based on games technology
KTP with Heart of England Foundation Trust, NHS





WMG
THE UNIVERSITY OF WARWICK

Visualisation, Modelling & Simulation

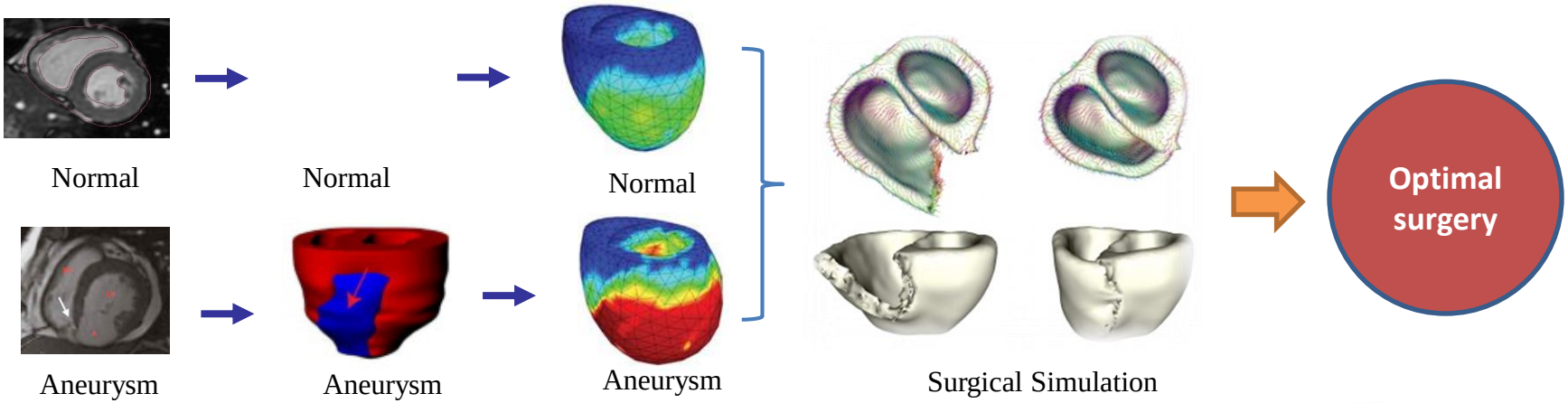
Institute of Digital Healthcare

Designing Patient-Specific Optimal Surgery : A Bi-Ventricular Modelling of the Human Heart – Collaboration with University Hospital Coventry and Warwickshire NHS Foundation Trust

- To study the mechanical characteristics of normal LV and LV with aneurysm
- Investigate the effects of different types of suturing techniques and its orientations on the mechanical characteristics of the diseased LV

Benefits:

- Avoiding unnecessary surgery & related rehabilitation procedure
- Time & Cost reduction



WMG
THE UNIVERSITY OF WARWICK

Patient Specific Medical Models

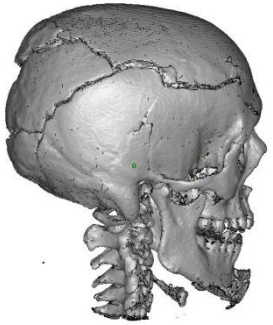
'The Mechanics of Man' – Royal Collection, Holyrood, 2013

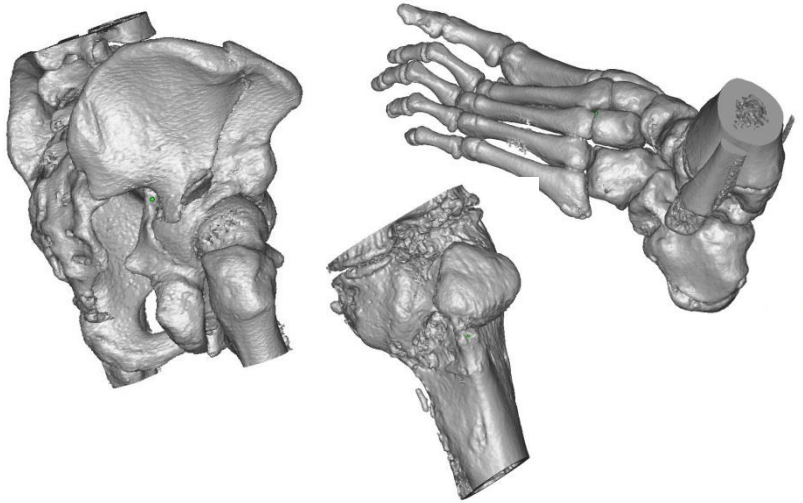
Used for:

- Surgery rehearsal
- Surgical Training
- Communicate to patients
- In-theatre visual references
- Jigs to shape off-the-shelf implants

Specific Examples:

- Orthopaedic surgical rehearsal
- Forensics

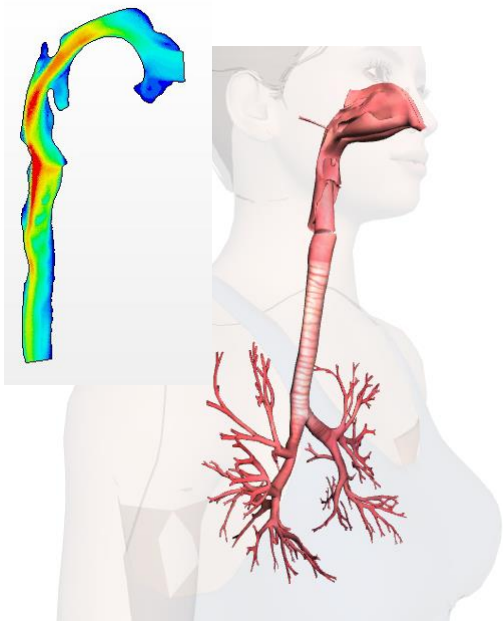




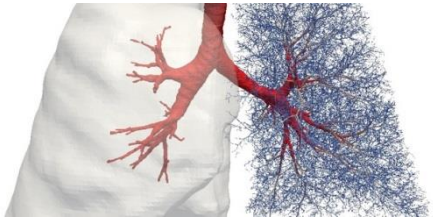
Product Development

Product Development

- Working with UHCW to develop innovations for the NHS
- Combination of 3DP and clinical expertise leading to real exploitable innovation



AirPROM

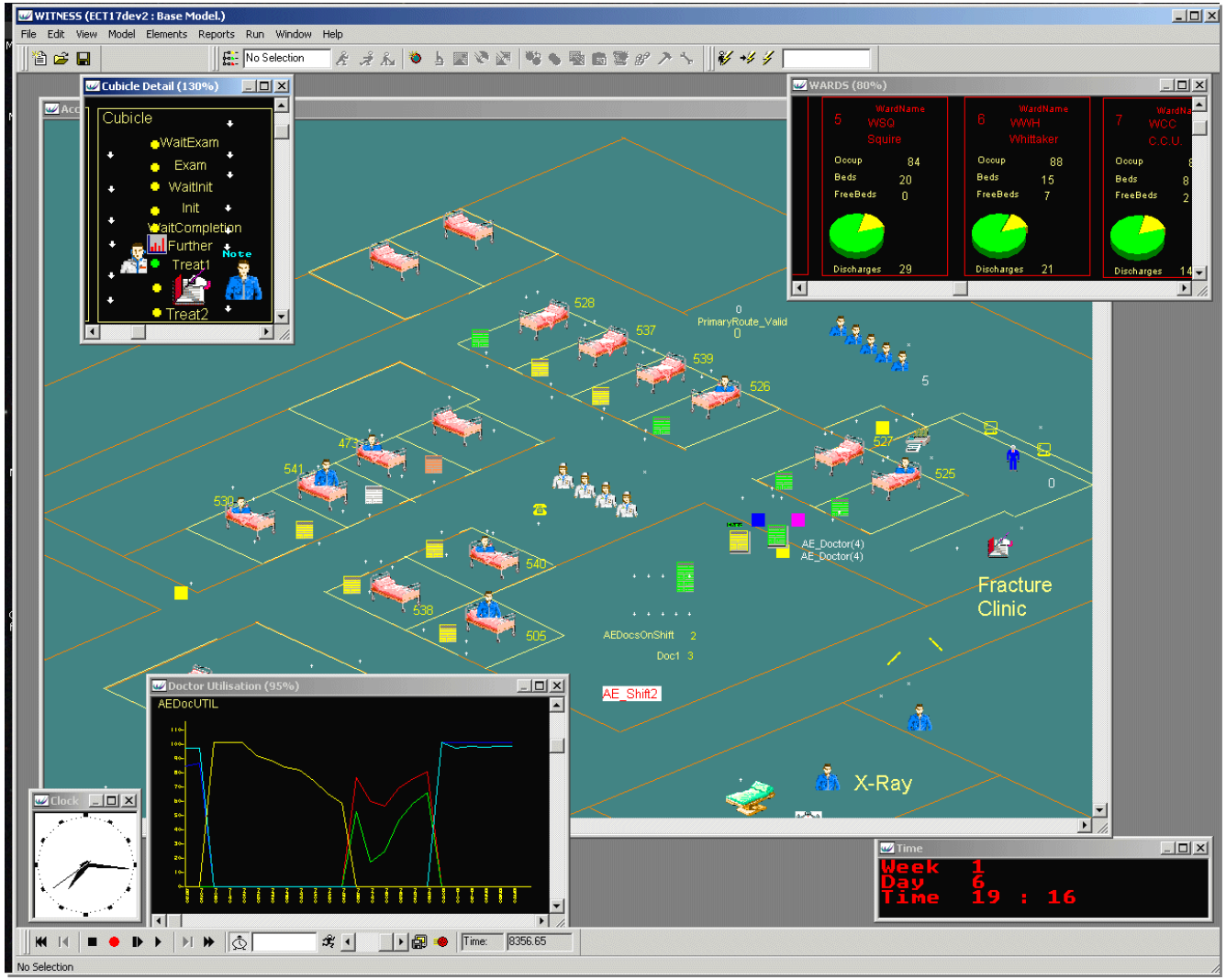


Realistic Medical Modelling

- Collaborating with EU Consortium to develop patient specific multi-scale model of the lung as a new way of characterising asthma and COPD

Hospital Modelling

Institute of Digital Healthcare



WMG
THE UNIVERSITY OF WARWICK

Pathway Variation Analysis

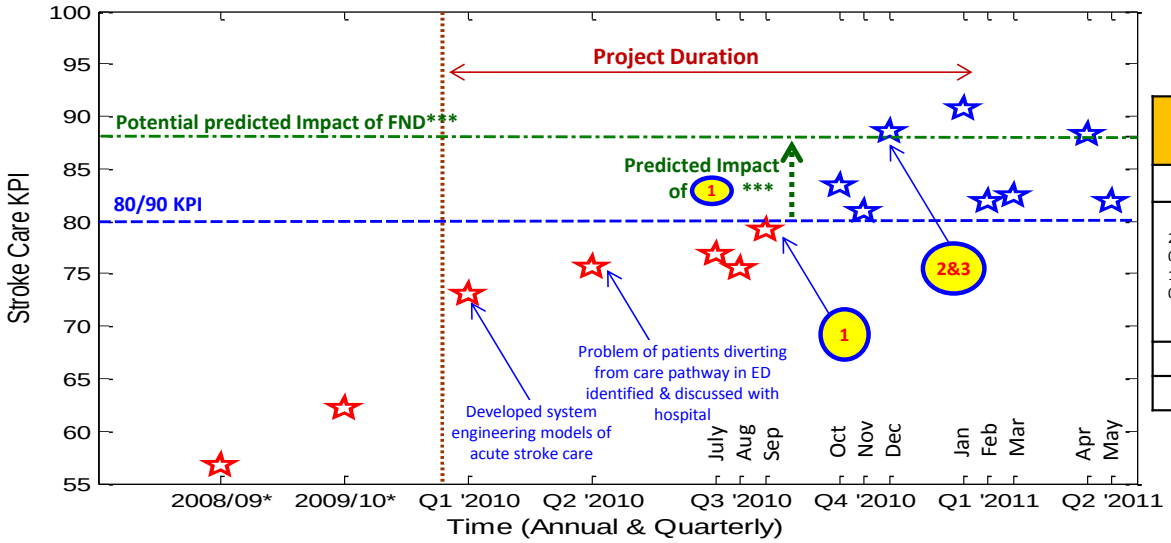
Institute of Digital Healthcare

Methodology Developed: Pathway Variation Analysis (PVA)

Implementation Results at the University Hospitals Coventry and Warwickshire

Problem: Acute stroke patients diverting from stroke pathway in ED resulted in hospital unable to meet DoH performance target (80% of stroke patients spend >90% of hospital stay in stroke unit)

Results: PVA-driven results leading UHCW to meet target *first time* since target mandated.



Time (Annual & Quarter)		Stroke Care KPI**
2011 - Q1		84.97
2010	Q4	84.24
	Q3	77.12
	Q2	75.66
	Q1	73.00
2009/10*		62.20
2008/09*		56.76

* UHCW Quality Account 2009/10

** Sample comprised of acute stroke patients treated at UHCW.

*** Predicted impact of focal neurological deficit (FND) patients on stroke care 80/90 KPI

(1): Patient diverting from care pathway

Suggestion 1 — *Re-designed sequence of clinical decision-making by having ED clinicians concentrate their clinical assessment on rapidly detecting presentations of focal neurological deficits (FND) which led to improved diagnostic accuracy of stroke referral from ED to stroke team.*

(2): Balance stroke unit bed capacity to manage increased incoming patient flow & variation

To manage the patient flow due to increased number of stroke patients correctly identified in ED:

Suggestion 2 — *Increase hyper-acute stroke unit capacity from 4 beds to 6 beds to manage increased patient flow & eliminate bottlenecks*

Suggestion 3 — *Balance bed capacity to manage patient flow variation by relocating entire hyper-acute stroke unit into the acute stroke ward*

WMG THE UNIVERSITY OF WARWICK

Innovations from SMEs

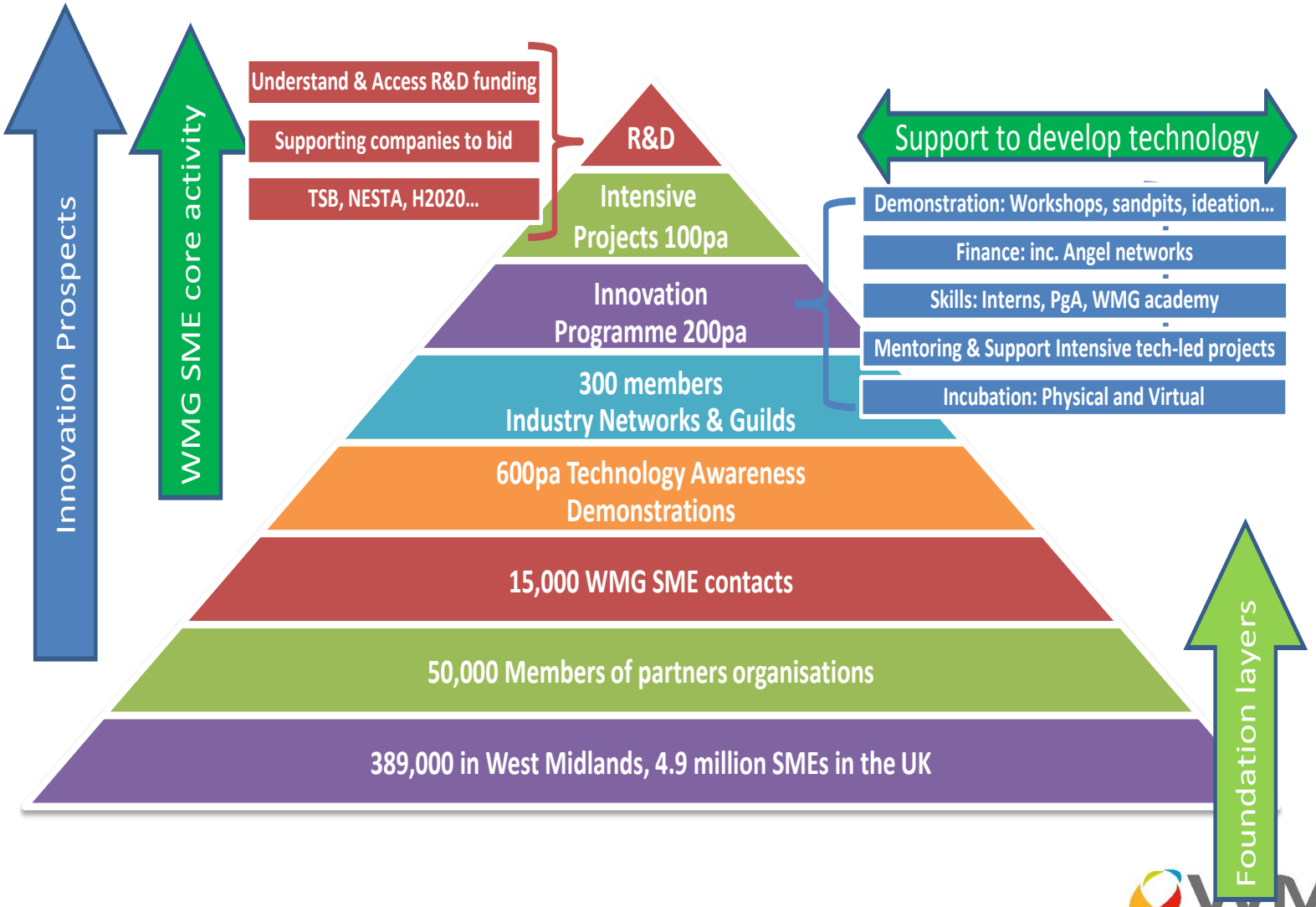
Institute of Digital Healthcare

- **Medilink UK**
- Stimulate growth and innovation
- West Midlands – 200+ member organisations – materials to components
- ‘Selling’ to NHS
  - Dyecor – ‘Thermcool’ transport drugs and blood products
  - 365 Healthcare – neck drape for complex surgical procedures
  - Quadraline – specialised cleaning fluids (ex motor industry)

WMG
THE UNIVERSITY OF WARWICK

Innovations from SMEs

Institute of Digital Healthcare



WMG
THE UNIVERSITY OF WARWICK

Exploit new areas of opportunity

Institute of Digital Healthcare

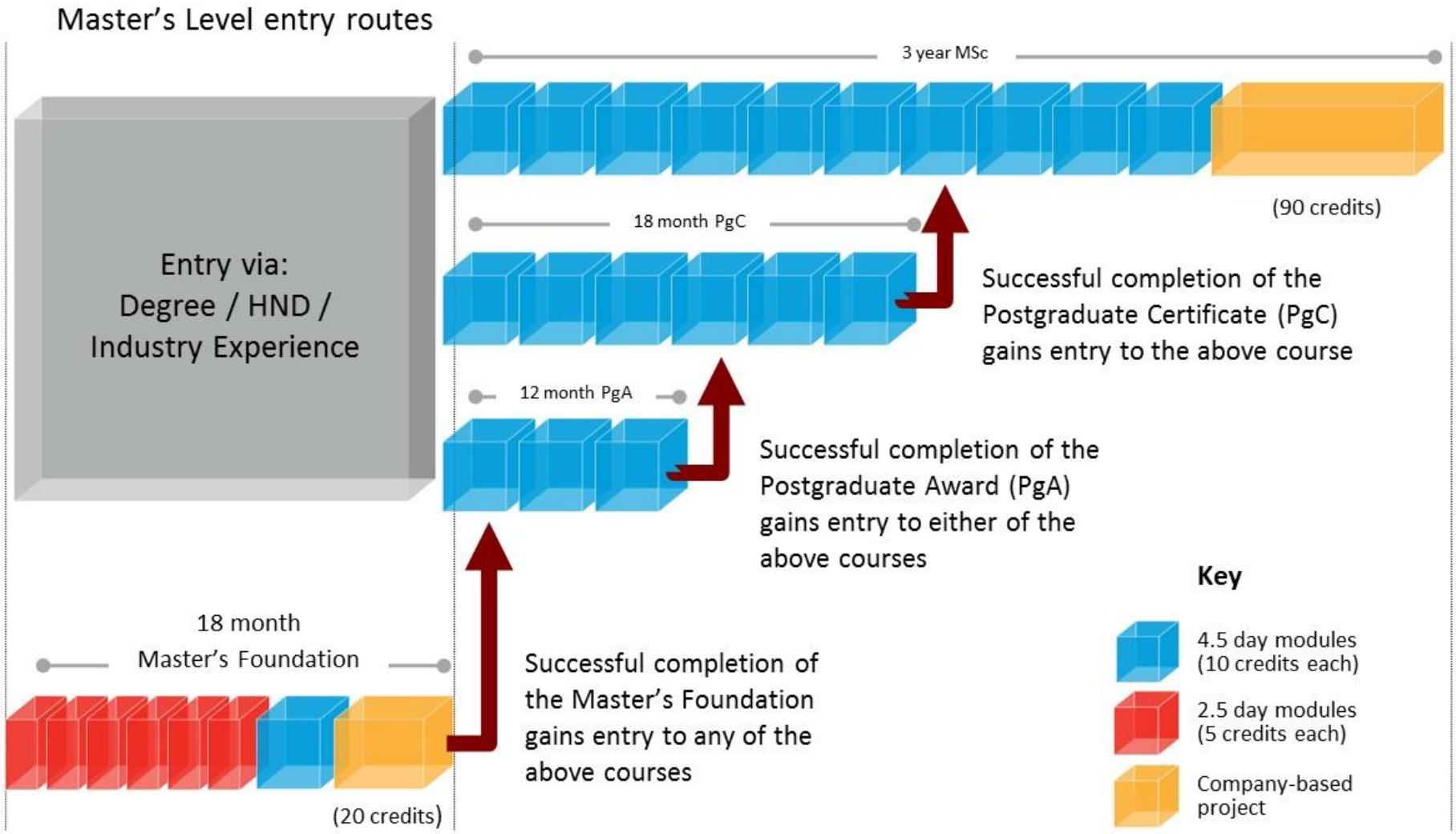
- **Cell Therapy Catapult**
- Grow UK cell and gene therapy industry to enable health and wealth
- RM 353M - cell and gene therapy manufacturing centre – process and assay development labs
- Space for collaboration, R&D to make risk manageable
- To grow cluster of activity and enable inward investment

WMG
THE UNIVERSITY OF WARWICK

Education and Training

Institute of Digital Healthcare
design : develop : deploy : evaluate

WMG Innovative Solutions



THE UNIVERSITY OF WARWICK

Medical Packaging Technology

- Does your company's packaging meet business and market needs?
- Do you have a fast and responsive packaging design and artwork development service?
- Do your packaging technologists understand customer needs?
- Do you want to grow the packaging capability of your business?

WMG
THE UNIVERSITY OF WARWICK

What do we cover?

Our accredited, five day, Master's level course provides expert insight into the principles, materials, processes, and other elements of packaging development, production, and use.

We put a strong focus on customer and supply chain requirements, with challenging inputs from user and industry perspectives such as:

- How is the pack going to be used?
- How is the pack going to be distributed and handled?
- How can packaging provide competitive advantage?
- What are the key technologies and processes?
- How does packaging design impact production line performance?
- Packaging and sustainability
- How can packaging support supply chain security?
- The application of new technologies – rapid prototyping

Is this for you?

Originally developed for the pharmaceutical industry, the course is readily adaptable to other industry sectors (in particular food, chemicals, and consumer goods). It can also be tailored and customised according to your particular needs.

We suggest delegates include packaging technologists, engineers, artwork managers, regulatory CMC specialists, launch coordinators, market account managers, and procurement category managers.

Delegates will be able to apply the knowledge gained to the decision making and problem solving associated with commercial, technical and aesthetic performance, cost, sustainability, safety, quality and compliance of packaging materials and packed products.

Education and Training

Institute of Digital Healthcare

- MSc Healthcare Operational Management (Oct 2016) full-time & part-time
- Online Short and Professional Courses –NHS, industry and healthcare providers focus
  - Advanced practitioner: Eating Behaviour (NHS staff e.g., dieticians; nurses)
  - Health informatics
  - Clinical IT safety
- **MRes(earch) – online in planning**
  - Digital Healthcare
  - Health informatics
  - Obesity & Eating Behaviour
  - Behaviour Change in Ehealth

WMG
THE UNIVERSITY OF WARWICK

Education and training

Institute of Digital Healthcare

- **Understanding Eating Disorders: For Teachers and Schools**

"Early identification of disordered eating is essential. It predicts recovery rates and other important outcomes. Often teachers lack confidence in dealing with these issues in school."

Course Aims

To inform teachers of up-to-date evidence about eating disorders and dispel any myths

- To help them feel empowered and spot early signs
- To give them confidence in approaching pupils
- To provide evidence-based information to pass on to parents/peers etc.
- To help them to consider important ways in which schools might help

Course Format and Delivery

The course is delivered using best practice e-learning via the University of Warwick e-learning portal.

WMG
THE UNIVERSITY OF WARWICK

The role of Impact

Institute of Digital Healthcare

Research Excellence Framework assessed the quality of research in all UK universities, in all disciplines. It was carried out by 36 expert panels, grouped into 4 main panels.

Main Panel A: **Medical and life sciences**

Main Panel B: **Physical sciences and engineering**

Main panel C: **Social sciences**

Main Panel D: **Arts and humanities**

- Impact of research included for the first time
- *"An effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia"*

- Encouraging all faculty to consider and enable the impact of their research – leading to significant innovation in healthcare

WMG
THE UNIVERSITY OF WARWICK

Institute of Digital Healthcare

Thank You

WMG
THE UNIVERSITY OF WARWICK